

# **Construction monitoring of Phase 3 Wheeler North Reef**



**April 12, 2021**

**SONGS Mitigation Monitoring Project  
Marine Science Institute, University of California Santa Barbara**

# Phase 3 Construction Requirements

- 200 acres with at least 42% cover of rock or equivalent (e.g. 100 acres with 84% rock coverage)
- Low relief, < 1 m high
- Coverage of natural rock < 30%

*Determined by monitoring post construction*

- Water depths of 28-49 feet
- Sand thickness < 2.3 feet (+/- 20%)

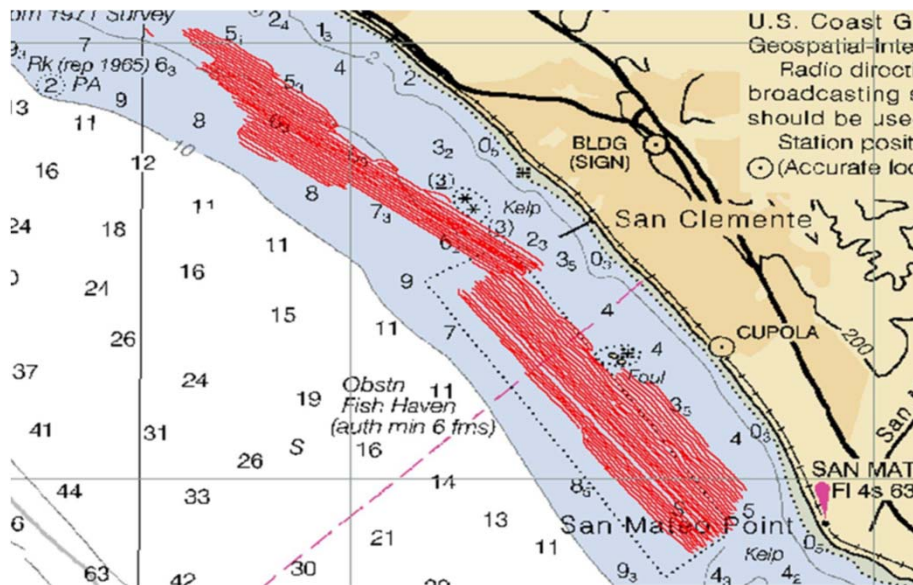
*Determined by monitoring pre-construction during project siting and design*



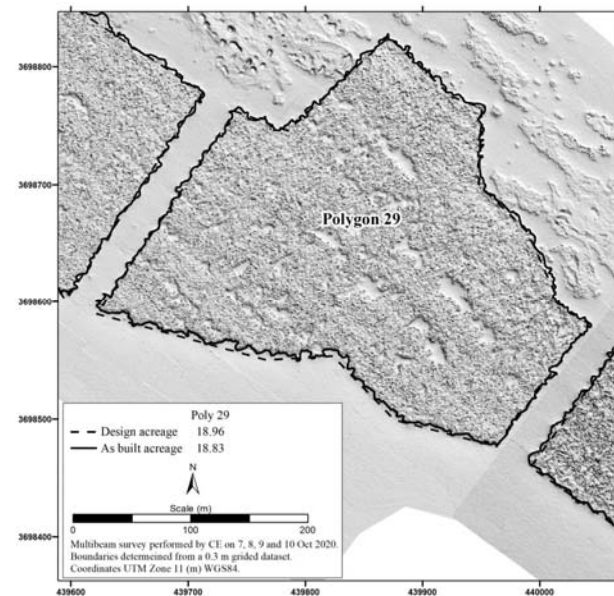
# Phase 3 Construction Monitoring

## *Methods for estimating reef acreage*

1. Bathymetric data from multibeam sonar surveys conducted by Coastal Environments Inc. used to delineate the boundaries of the 20 Phase 3 polygons
2. Surveys covered 100% of the project area and were completed in October 2020 using the same methods used to survey Phases 1 and 2 in 2009 and 2014.
3. Bathymetric data analyzed using QPS QIMERA multibeam processing software
4. Boundaries defined as the interface between sand and rock



Vessel tracks showing area surveyed



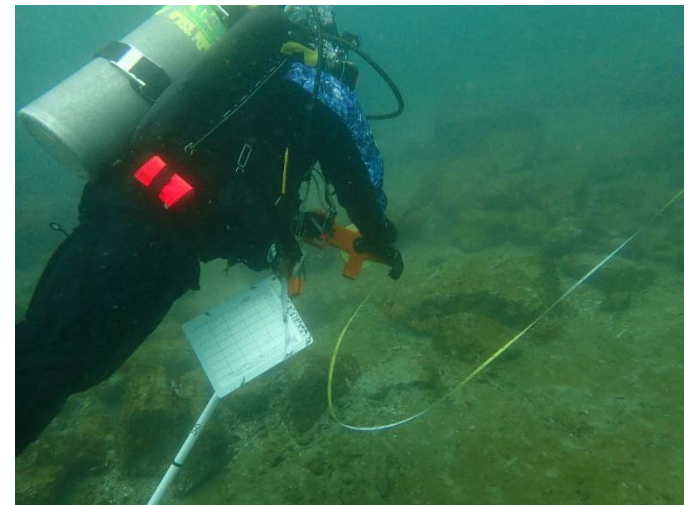
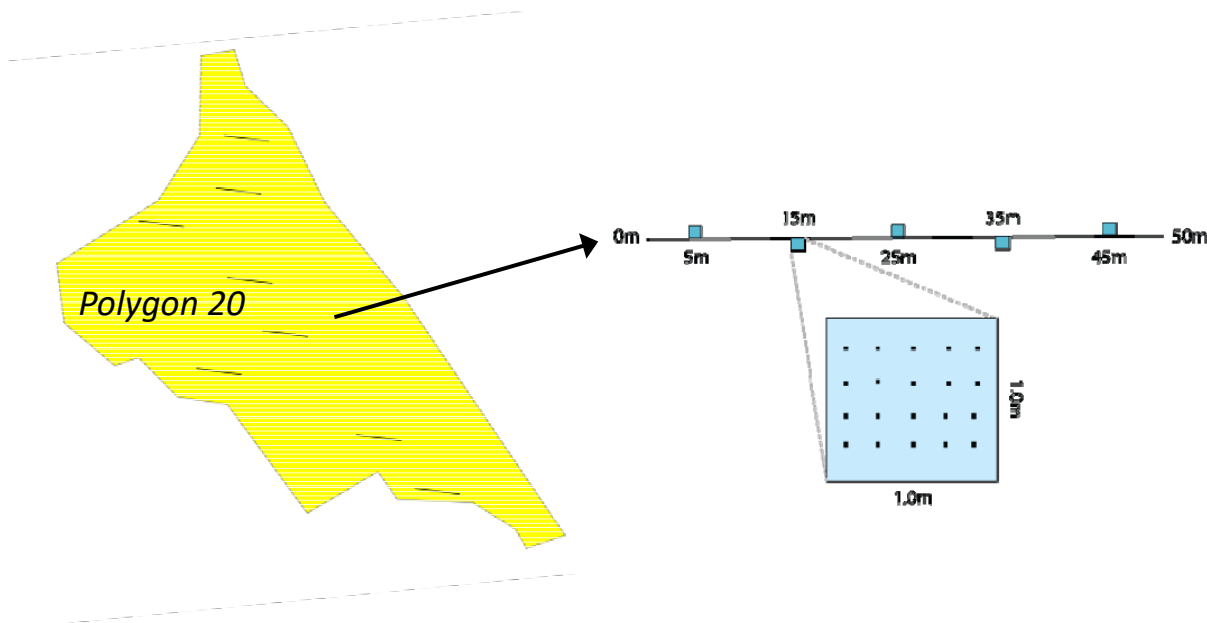
Boundary of Polygon 29 as estimated from bathymetry data



# Phase 3 Construction Monitoring

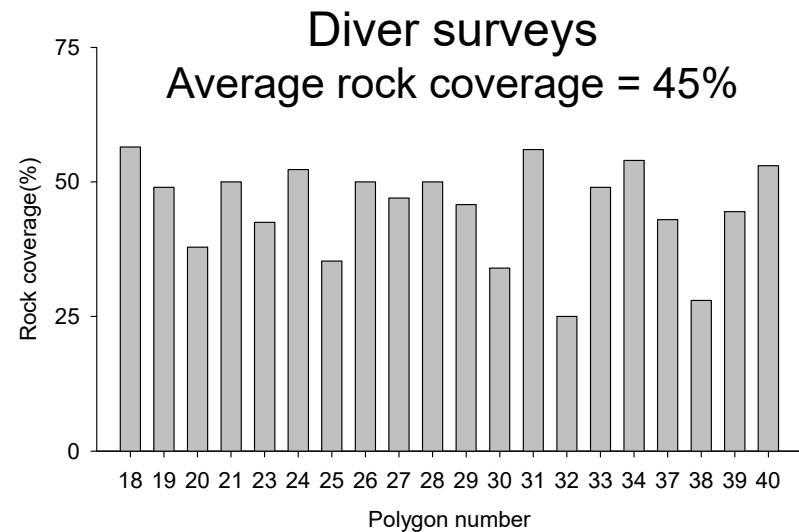
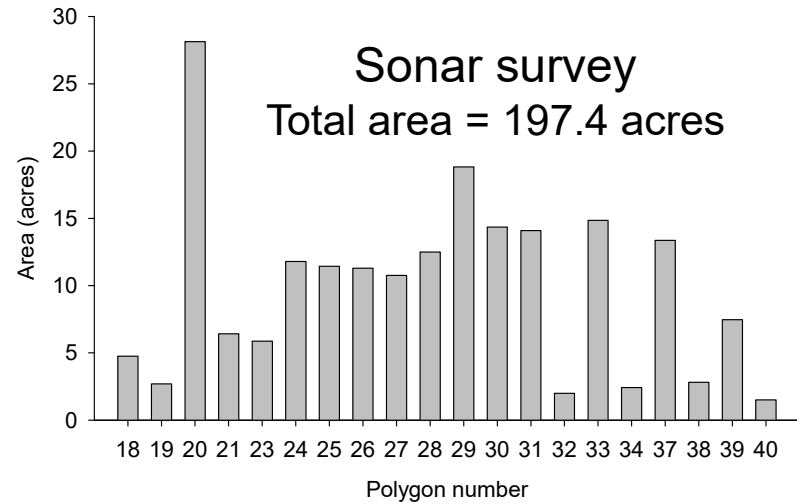
## *Methods for estimating rock coverage & reef height*

1. Transects 50 m in length distributed across each polygon at a density proportional to polygon area.
2. Percent cover of quarry rock estimated by divers from a grid of 20 uniform points in five 1 m<sup>2</sup> quadrats placed every 10 m along each transect.
3. The % cover of rock in each polygon was determined from all the points sampled in that polygon, and was weighted by proportional area of the polygon relative to the combined area of all 20 Phase 3 polygons.
4. Requirement for reef height ( $< 1$  m) was assessed visually by divers



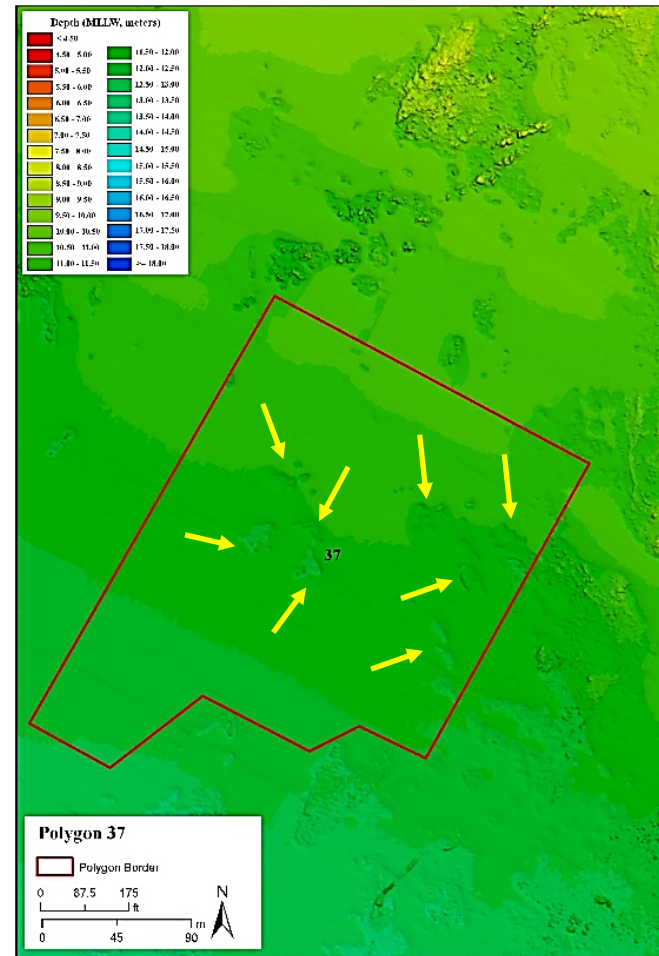
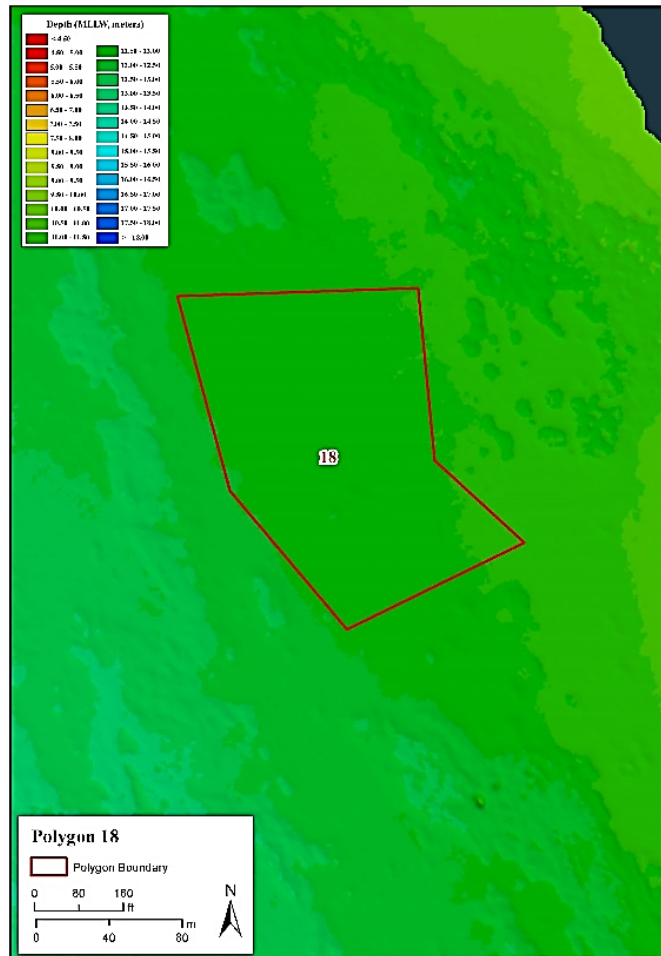
# Phase 3 Construction Monitoring

## Results: Polygon acreage and rock coverage



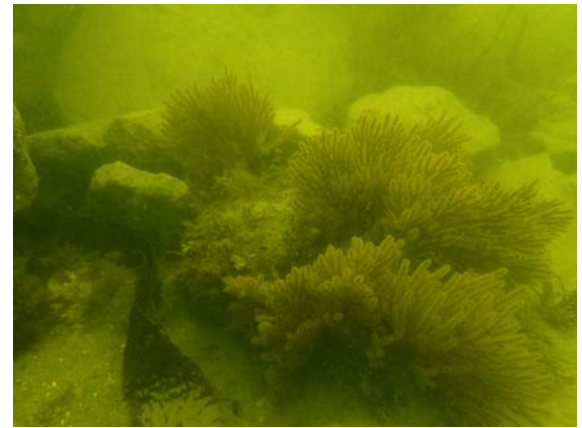
# Estimating the coverage of natural rock within Phase 3 polygons

1. Examine 2016 bathymetry maps for each of the 20 Phase 3 polygons to identify potential areas of natural rock



## Estimating the coverage of natural rock within Phase 3 polygons

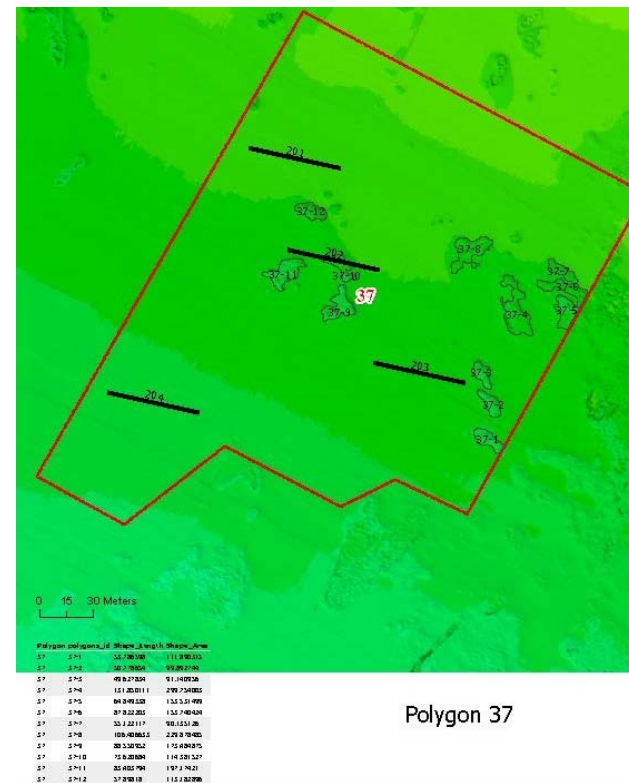
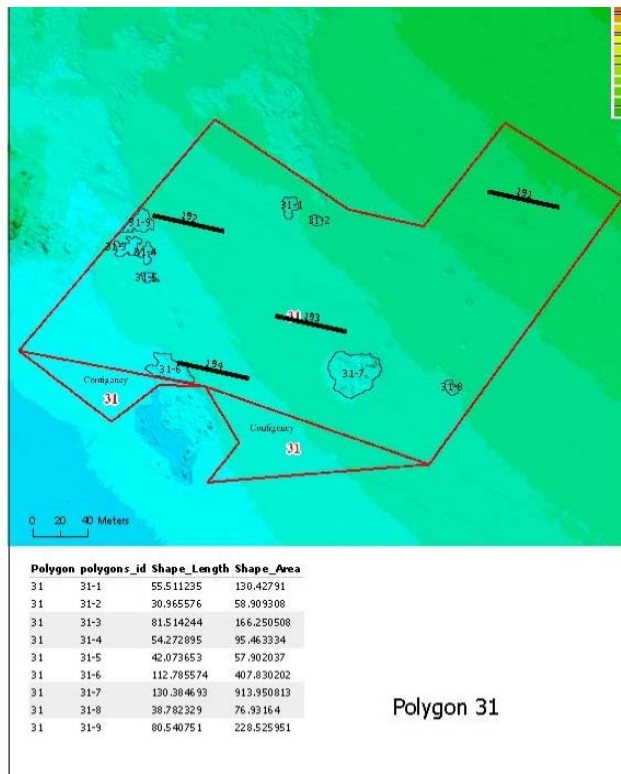
2. Conduct surveillance dives in summer 2020 to verify natural rock in areas identified from bathymetry maps





# Estimating the coverage of natural rock within Phase 3 polygons

- Calculate area of natural hard substrate in bathymetry maps using ArcInfo GIS

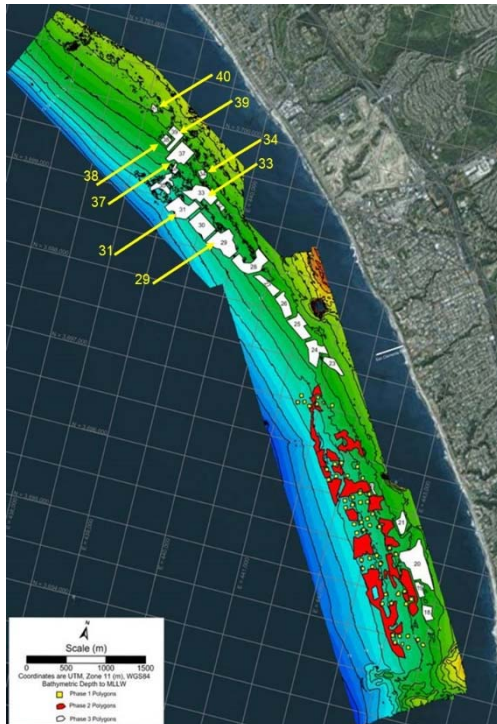


- Calculate the % cover of natural hard substrate in each polygon as rock  $(\text{area} / \text{polygon area}) * 100$



## Results: Phase 3 overlap with natural rock

- Areas of natural hard substrate found in 8 of the 20 Phase 3 polygons
- All 8 polygons located in the northern portion of the lease area
- The percent cover of natural rock in the polygons was  $\ll 30\%$  allowed by the CDP
- Cumulative area of natural hard substrate within the Phase 3 polygons = 2.14 acres
- Area needed for a remediation reef with 45 % cover of rock = 186 acres
- 197.4 acre as-built – 2.14 acres of overlap = 195 acres with zero natural rock (i.e., 9 acres more than needed)



Polygon	Acres	Natural rock (acres)	Natural rock (percent)
29	18.96	0.01	0.05
31	14.35	0.53	3.69
33	14.56	0.43	2.95
34	2.34	0.17	7.26
37	13.18	0.45	3.41
38	2.7	0.15	5.56
39	7.1	0.35	4.93
40	1.48	0.05	3.38
<b>Total</b>	<b>74.67</b>	<b>2.14</b>	<b>2.87</b>

# Phase 3 Construction Monitoring

## Results Summary



**Requirement:** 200 acres with at least 42% cover of rock or equivalent

*As built:* 197.4 acres with 45% cover of rock (186 acres with 45% cover needed)



**Requirement:** Low relief, < 1 m tall

*As built:* Low relief, < 1 m tall (no areas > 1 m tall observed)



**Requirement:** Coverage of natural rock < 30 %

*As built:* - Natural rock observed in 8 of 20 polygons ranged from 0.05 to 7%  
- Natural rock accounted for 2.14 of the 197.4 acres (= 1.1%)

**Conclusion:** *Wheeler North Reef Phase 3 expansion was built according to plans and met all of the requirements of its coastal development permit*

